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H-2A Guest-Workers Program

ADOPTION AND USAGE BY SOUTHEASTERN GROWERS

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RESEARCH QUESTIONS

- Why are U.S. farmers using the H-2A guest-workers program at such widely different rates?

- Is there a pattern to diffusion of the program across Southeast U.S. counties?

- Is there a contagion effect?
BACKGROUND

• U.S. farmers still dependent on labor

• Specialty crops.
  • fresh fruits and vegetables
  • landscape and horticulture

• Ranching/herding
BACKGROUND

• Labor shortages are a pressing issue
  • Declining migration from Mexico
  • Occupational migration out of agriculture (Barkley:1990)
• The number of H-2A positions certified by the U.S. department of labor increased every year since 2011, overall increase of 81% between 2011 and 2015 (OFLC, 2016)
• Widely different participation rates across states
  https://www.fb.org/viewpoints/farm-labor-shortage-affects-more-than-u.s
Total Workers Certified
(United States Southeast)
Top 10 Visa Requesting States (Entire United States)
H-2A Guest-workers Program: Adoption and Usage by Southeastern Growers

- Why are U.S. farmers using the H-2A guest-workers program at such widely different rates?
- Is there a pattern to diffusion of the program across Southeastern U.S. counties?
- Is there a contagion effect?
METHODS (DATA)

Spatially weighted panel data
- Individual unit of observation (Southeast U.S. counties)
- Time period spans 11 years (2006-2016)
- Control for spatial relationships with a spatial weights matrix
  - Define neighbor as contiguous counties (all counties with a shared border)

Dependent Variable
- **Program usage** (number of workers certified), aggregated by county
- **Program adoption** (usage > 0, preceded by usage 0)
METHODS (DATA)

Why only analyze data for the Southeastern U.S.?
- Accessibility of data
- Time constraints

Why disaggregate usage and adoption data at county level instead of individual firm level?
- Interested in program usage by end users (farmers) not FLCs (farm labor contractors)
- Unique addresses provided for all firms requesting H-2A visas, however a significant portion of these are FLCs not the end users themselves.
- Worksite (farm) location only provided at city/county level
METHODS (DATA)

Demographic variables
• % unemployment (disaggregated by county)  U.S. Bureau of Labor Statistics
• % Hispanic population (disaggregated by county)  U.S. Census Bureau
• % annual average weekly wages (disaggregated by county)  U.S. Bureau of Labor Statistics

Production variables
• Acres harvested (blueberries, strawberries)  U.S. Census Bureau
• Acres bearing (avocados, apples, citrus, grapes, peaches)  U.S. Census Bureau
• Acres harvested (vegetables: 34 different varieties e.g. asparagus, beans, beets, broccoli, cabbage, carrots, cauliflower etc.)  U.S. Census Bureau
METHODS (DATA)

• Agricultural production data only available for Census years 2002, 2007 and 2012
• Estimated for missing years by using beta-within regression

\[ Y_{it} = X_{it} \beta + \alpha_i + u_{it}, \]

• \( Y_{it} \) county level production of the given crop at time t,
• \( \alpha_i \) time-invariant individual effects,
• \( X_{it} \) a 1 × 2 matrix of the regressors (state-production and year),
• \( \beta \) parameter estimates,
• \( u_{it} \) error term
METHODS
Test for Spatial Auto-correlation with Moran’s I

Moran’s I (introduced by P.A.P Moran 1950)

\[ I = \frac{n \sum_i \sum_j w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{W \sum_i (x_i - \bar{x})^2} \]

- \( n \) number of observations,
- \( w_{ij} \) is the matrix of spatial weights,
- \( x_i \) is the variable of interest for observation \( i \),
- \( \bar{x} \) is the sample mean of the variable of interest,
- and \( W \) is the sum of all the weights.

- Global Moran’s I (entire sample)
- Local Moran’s I (computed for each node/individual)
- Computed Using Geoda (software)
METHODS
Spatial Autoregressive Model (modeling program usage)

\[ y_{it} = \lambda \sum w_{ij} y_{jt} + x_{it} \beta + \varepsilon_{it} \]

- \( y_{it} \)  individual \( i \)'s usage level at time \( t \)
- \( w_{ij} \) spatial weights matrix
- \( \lambda \) spatial autoregressive coefficient,
- \( \mu_i \) are the individual fixed effects,
- \( x_{it} \) combination of factors (demographic data, production data)
- \( \varepsilon_{it} \), an error term that includes the spatial autocorrelation coefficient
METHODS

hazard model (modeling program adoption)

\[ \eta_{ijt} = \sum w_{ij} \lambda_{it-1} + x_{it}'\beta + \gamma_t + \varepsilon_{it} \]

• \( \eta_{ij} \) utility individual \( i \) gets from choosing option \( j, j = \begin{cases} 1, \text{if adopted} \\ 0, \text{otherwise} \end{cases} \)

• \( \Pr(\text{of i choosing j}) = \pi_{ij} = \frac{\exp(\eta_{ij})}{\sum \exp(\eta_{ik})} \)

• \( \sum w_{ij} \lambda_{it-1} \) lagged exposure (proportion of neighbors using the program in period \( t - 1 \))

• \( x_{it} \) a combination of factors (demographic data, production data)

• \( \gamma_t \) time effects

• \( \varepsilon_{it} \) error term
RESULTS
Local Moran’s I significance clustering (usage 2009)
RESULTS
Local Moran’s I significance clustering (usage 2012)
RESULTS
Local Moran’s I significance clustering (usage 2015)
### H-2A Program Usage Levels in Southeast U.S. Counties (Spatial Autoregressive Model)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho$ (spatial auto-correlation)</td>
<td>-0.659</td>
<td>0.029</td>
<td>***</td>
</tr>
<tr>
<td>$\lambda$ (spatial-lagged coefficient)</td>
<td>0.645</td>
<td>0.016</td>
<td>***</td>
</tr>
<tr>
<td>unemployment-rate</td>
<td>-0.961</td>
<td>0.240</td>
<td>***</td>
</tr>
<tr>
<td>Hispanic % of pop.</td>
<td>2.809</td>
<td>0.800</td>
<td>***</td>
</tr>
<tr>
<td>production (avocados bearing-acres)</td>
<td>0.066</td>
<td>0.037</td>
<td>*</td>
</tr>
<tr>
<td>production (citrus bearing-acres)</td>
<td>-0.088</td>
<td>0.007</td>
<td>***</td>
</tr>
<tr>
<td>production (blueberries acres harvested)</td>
<td>0.386</td>
<td>0.074</td>
<td>***</td>
</tr>
<tr>
<td>production (strawberries acres harvested)</td>
<td>-0.339</td>
<td>0.117</td>
<td>**</td>
</tr>
</tbody>
</table>

* Insignificant variables not reported: av. weekly wage-rate, production (apples, grapes, peaches)

*** sign. P-value $\leq 0.001$
** sign. P-value $\leq 0.05$
* sign. P-value $\leq 0.1$
H-2A program adoption in Southeast U.S. Counties (Hazard model)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.650</td>
<td>0.368*</td>
<td></td>
</tr>
<tr>
<td>( \lambda \sum w_{ij} y_{jt} )</td>
<td>0.557</td>
<td>0.280**</td>
<td></td>
</tr>
<tr>
<td>Unemployment-rate</td>
<td>0.057</td>
<td>0.028**</td>
<td></td>
</tr>
<tr>
<td>av. weekly wage</td>
<td>-0.001</td>
<td>0.000*</td>
<td></td>
</tr>
<tr>
<td>production (blueberries bearing acres)</td>
<td>0.013</td>
<td>0.006**</td>
<td></td>
</tr>
<tr>
<td>production (avocados bearing acres)</td>
<td>0.000</td>
<td>0.000*</td>
<td></td>
</tr>
<tr>
<td>production (apples bearing acres)</td>
<td>-0.003</td>
<td>0.001***</td>
<td></td>
</tr>
<tr>
<td>production (grapes bearing acres)</td>
<td>0.000</td>
<td>0.000*</td>
<td></td>
</tr>
<tr>
<td>production (vegetables acres harvested)</td>
<td>0.000</td>
<td>0.000**</td>
<td></td>
</tr>
</tbody>
</table>

Insignificant variables not reported: % Hispanic Population, production (strawberries, citrus, peaches)

*** sign. P-value\( \leq 0.001 \)
**  sign. P-value\( \leq 0.05 \)
*   sign. P-value\( \leq 0.1 \)
FINDINGS (Usage Levels)

• Individual counties’ usage levels are positively correlated with neighbors’ usage levels.

• Unemployment rate is negatively correlated with program usage levels.

• Consistent with program goals. Agricultural producers use the program amid domestic labor shortages.
FINDINGS (Program Adoption)

Lagged exposure (% of one’s neighbors who had adopted in previous period)
- Significant and positively correlated with program adoption
- Suggests a contagion effect exists

Unemployment rate
- Positively correlated with program adoption
- Producers begin using the program despite relatively high unemployment
- Unemployment data is for all sectors including agriculture

Wages negatively correlated with the program adoption
CONCLUSION

We find evidence H-2A program users are being influenced by their neighbors’ usage, in addition to production demands, and demographic variables (e.g. unemployment rate).

Is there a pattern to diffusion across the U.S. Southeast?
  – Yes (attested by significance of l.exposure in hazard model)

Reason for different usage rates across the country?
  – Still unclear

Is there a contagion effect?
  – Yes
What next?

• Show causality of neighbors’ usage levels on own usage levels. (Possibly spatial Arellano-Bond model)

• Improve both models by including more explanatory variables (production, H-2A job-type, county population of agricultural workers)

• Consider other models: random effects, spatial-error model.

• Expand analysis to entire United States

• Disaggregate data by firm, rather than county.
  • Individual units of observation, agricultural firms.
References


